# ATTACHMENT A
# Sciences and Exploration Data Analysis
# (SESDA-II)
# Statement of Work
# NNG06EB68C

## 1. PURPOSE

The purpose of this contract is to provide the development and use of scientific computer systems, engineering data analysis systems, engineering efforts that develop new technologies for scientific instrumentation, software application development and implementation, and computer system management for Science Exploration research at the GSFC.

## 2. SCOPE

The services required under this contract support a broad range of science disciplines, including solar and space plasma physics, astrophysics and astronomy, planetary studies, atmospheric science and climatology, oceanography, land processes, geodynamics, and solid earth geographics. Research and information technology services includes scientific data analysis; modeling and simulation of physical processes; development of flight project data systems, including field experiments, development of large-scale data management, archival and delivery systems, systems analysis, and programming; and includes engineering, technology, development and research network engineering. The contractor shall support work in all these areas.

Work carried out under this contract is primarily funded by several key organizations (Sciences and Exploration Directorate, Flight Programs and Projects Directorate, and the Applied Engineering and Technology Directorate) within GSFC. These directorates have pivotal roles in NASA's newly released strategic plan outlining a new approach to space exploration using a "building block" strategy to explore scientifically valuable destinations across our solar system. The GSFC also has other areas of strategic responsibility which support NASA's programs and new areas are being assigned by Headquarters from time to time. Most of the services provided will be in direct support to the Science, Flight Programs, Information Technology and Engineering organizational entities at the GSFC. The areas of strategic responsibility for this contract are defined below by category with expanded definitions.

## 3. PERFORMANCE REQUIREMENTS

The Contractor shall provide support in the functional areas listed below.

3.1 Scientific Data Processing
3.2 Modeling on Data Analysis
3.3 Information Extraction Support

3.4 Multi-mission Data Archival and Analysis
3.5 Computer System(s) Management
3.6 Mission Feasibility Planning
3.7 Systems Development/Systems Engineering
3.8 Applications Software Development and Use
3.9 Database Creation and Data Archiving
3.10 Production Processing
3.11 Telecommunications
3.12 Ground Support
3.13 User Support
3.14 Engineering Support
3.15 Education Outreach
3.16 Science Utilization Support

Each of these functional areas is described below.

### 3.1 Scientific Data Processing

The scientific data processing support requires the design of efficient input/output and data packing/unpacking techniques: the application of total instrument calibration results to experiment data: data reformatting operations; handling and correlating satellite and detector housekeeping information required for data analysis; elimination of data overlap and merging of orbit and attitude data with experiment data where necessary; applying the appropriate data reduction to algorithms to process the raw initial data into final physical units; and implementing numerical algorithms.

### 3.2 Modeling and Data Analysis

The data analysis operations require computer programs encompassing such areas as mathematical modeling of physical theories and associated numerical and scientific analyses, pattern recognition, simulation of physical systems, image data analysis, dynamic interaction with graphical displays, and data correlation studies using statistical techniques. This requires problem analysis, algorithm restructuring and program implementation for integration both of new supercomputing technology and advanced workstations via high-speed networks.

### 3.3 Information Extraction Support

The information extraction support requirement includes mathematical analysis and computer implementation of techniques to perform such functions as radiative transfer and microwave scattering analysis, image enhancement, noise removal, radiometric corrections, geometric correction, registration, filtering and other transformations, pattern recognition, multivariate classification, and change detection of Earth resources and meteorological image data. Included will be conducting surveys or literature searches, gathering or generating related data, setting up and conducting tests, analysis of test

results, producing reports of the investigation, recommending solutions and development, and implementing techniques to solve particular information extraction problems.

### 3.4 Multi-mission Data Archival and Analysis

The Contractor shall provide support in astrophysics and other science communities with access to archival data from X-ray and Gamma ray and other flight missions. This will include maintaining and disseminating data from previous and concurrent missions as well as for missions in many disciplines; providing software and data analysis support for these data sets; developing and maintaining tools for combining the data from the various missions and for multi-data set analysis; providing a uniform environment for analyzing and combining the data from the various missions; developing and maintaining catalogs of observations and ancillary information for data holdings relevant to that wavelength band; providing online access to catalogs of results from each mission; deriving a uniform set of data products from each mission; coordinating data, software and media standards with other parts of the Astrophysics Data System, including other multi-mission centers; writing and distributing a regular newsletter; and distributing the level 1 raw data, the derived level 2 data products, catalogs of results, the calibrations, the analysis software, and the documentation.

### 3.5 Computer System(s) Management

The Contractor shall provide system administration and management that includes items such as installing, updating, and testing new releases of manufacturer-supplied operating systems, commercial software packages, and other software necessary for evolving computer systems. The Contractor shall provide programming support for all phases of system software development. This includes such items as the development, modification and enhancement of operating systems, systems software, data management systems/routines, web servers, mail servers, image display and control functions, various system support routines, special device handlers, configuration management, and diagnostics for special peripherals.

The contractor areas of responsibility shall include but not limited to setup of end-user authorization, accounting system, perform backups (e.g., incremental and full of all critical system/user files and data for a rebuild to the nominal state at any point within a 6-12 month period, depending on facility), routinely monitor for availability of critical updates and/or patches, maintain current/accurate information of configuration for all hardware/software, and computer security monitoring. Configuration information shall be made available to the government at all times. Provide general maintenance functions required of system management performing error analysis, monitoring/tailoring system performance, monitor log files for unusual activities and report to management, consulting, and other activities that are required of system management. Provide responsive and communicative technical support to the end-user. The contractor shall provide as needed support to NASA and/or GSFC-wide initiatives such as vulnerability scanning and remediation. Develop and update IT security plans, contingency plans and

risk assessments as directed. The contractor shall assist the government with the on-going development of IT systems configuration policies and/or enforcement.

The Contractor shall provide the full range of science services required for fully utilizing a spectrum of scientific services on a spectrum of computer systems from small standalone workstations to a networked large-scale supercomputing facility. This includes documentation, problem tracking and resolution, code optimization or conversion, algorithm restructuring, telephone or online assistance, software tailoring to meet user requirements, training, performance analysis of application packages, and other activities that are required to support system activities. When appropriate, coordination with NASA's Outsourcing Desktop Initiative Network (ODIN) contractor or CNE is required.

### 3.6 Mission Feasibility Planning

Technical inputs for mission planning, including development of activity schedules, resource estimates and management documentation such as mission plans shall be provided. The Contractor shall also provide supporting technical analysis for GSFC mission integration with other organizations including other NASA field centers, science working groups, advisory groups, investigators, and other entities. The Contractor shall identify conflicting needs and propose solutions. The Contractor shall provide supporting technical analysis for the preparation of technical papers, reports, proposals, and newsletters. Technical support also includes the editing function for revising and updating documents, coordinating the physical production and distribution of various mission documents.

The Contractor shall establish and maintain the design, development, and maintenance of mission databases including payload, hardware, experiment, requirements traceability, operational and documentation databases. The Contractor shall organize and coordinate mission feasibility meetings and conferences as well as develop materials such as brochures, videotapes, web sites, and displays, coordinating and participating in events. The Contractor shall support local and national physical sciences education programs including the preparation of classroom materials.

### 3.7 Systems Development/Systems Engineering

The Contractor shall be required to support all phases of systems development/systems engineering. This includes such areas as requirements definition and analysis; conceptual and detail design; integration; hardware sizing and validation; the development of technical documents including information technology documents for targeted systems; software configuration control; and the development and control of external interfaces including digital communication networks. Such support may include aspects of mechanical, electrical, and digital engineering along with aspects of the computer sciences.

In support of the various scientific research, the Contractor shall provide research, design, integration and enhancement of technical systems consisting of both hardware and/or software, and the integration of the same.

### 3.8 Applications Software Development and Use

The Contractor shall, in coordination with users, define specific design requirements, identifying and understand applicable hardware and system software capabilities and constraints, documenting the proposed design, coding, testing, documenting and maintaining software packages, implementing software configuration control, and demonstrating and/or training users in program or system operation.

The applications software development will typically be in the areas of image enhancement, noise removal, CAD/CAM, radiometric correction, geometric correction, registration, filtering and other transformations, change detection, multi-spectral classification, statistical and mathematical analysis, and related image and non-image data analysis functions. Maintenance and modification to existing operations applications software shall also be required. This function includes the removal of software errors, changing the code for improved operations, and making additions to provide new capabilities. Applications software development also includes the visualization of science data in multi-media form, which may be suitable for research purposes or the general public.

### 3.9 Database Creation and Data Archiving

The date archiving, database creation, data warehousing, data mining and display functions of the rapidly evolving data management technologies require the Contractor to provide for computing systems to automatically generate data catalogs, file statistics, provide data quality summaries and retrieval of data and extraction of information and knowledge from the science archives and databases created.

### 3.10 Production Processing

This function includes the preparation of computer runs for job submission and the use of computer programs for the reduction and evaluation of computational results. The Contractor shall maintain files and records of all data received and of all data processed, to set up and maintain science information libraries across a range of technologies, online work files and production logs. The Contractor shall provide for the creation and operation of graphical displays for interactive processing of data displayed modern visualization equipment and on hard copy devices, and for the operation of other computer-driven equipment used to analyze or reduce data. Display of other scientific and engineering data, data entry, and other operations analysis work shall be required.

### 3.11 Telecommunications

The Contractor shall plan, develop, implement, and test advanced telecommunications systems, supporting all evolving high performance network/web based science systems. The Contractor shall monitor performance, gather statistics, generate reports, evaluate performance, troubleshoot, analyze and resolve problems in the area of networking systems.

### 3.12 Ground Support

The real-time ground support systems shall require software for telemetry acquisition and storage, various data displays, experiment monitoring, and instrument commanding. In addition, the Contractor shall be required to provide systems support such as systems generation and local modification to the operational system. This includes science field experiments, nationally and internationally.

### 3.13 User Support

The Contractor shall schedule classes and seminars, assisting in a user support capacity. The Contractor shall train users in order to familiarize them with applications software packages for image processing and computer graphics. Also included is working with and setting up visiting scientist programs, field campaigns and mission support, outreach activities, science education support and technical support for science conferences.

### 3.14 Engineering Support

All basic, applied and development facets, including design, development, fabrication and verification of space instrumentation is required. The Contractor shall also provide engineering designs and analyses of an instrument, drafting component sections, development of electronic components, field testing, and the verification of acceptable performance of systems, subsystems, and instrumentation when coupled with the computer support.

### 3.15 Educational Outreach

The Contractor shall be responsible for the preparation of educational materials via written, electronic, web, and audio-visual vehicles and formats that include publications, posters, instruments, apparatus, items, videos, software, hardware, CD Roms, laser discs, and other technology based mediums.

The sciences educational programs at the Center encompass outreach and partnering; development activities with schools, teachers, and students; support of generation of educational technology; the sponsorship or creation of materials; and activities to improve Earth and Space science literacy in the general public and specific audiences.

Examples of the activities include writing, editing, desktop publishing, design, layout, imagery, animation, communications, publicity, documentation, presentations,

visitations, field trips, and support of meetings, conferences, and collaborative projects from a wide range of educators and interest groups.

### 3.16 Science Utilization Support

The Contractor shall be required to support in identifying specific technologies, science data and products that will have a benefit for the society. This includes multiple areas such as Homeland Security, Air Quality, Disasters, Agriculture Efficiency, Energy, Coastal Zone management, Water, Public Health, Aviation Safety, Ecological forecasting, and Carbon management. The Contractor shall work with the Goddard science community in identifying, proposing, and developing specific products which will be valuable to the user community or operational agencies such as NOAA, EPA, USDA, and other non Governmental organizations in making critical decisions impacting our society. This will also include international entities such as the United Nations, World Meteorological Organization, and others. The Contractor will work closely with the Office and Science Utilization and coordinate all of their related activities with that office.

## Electronic and Information Technology Accessibility Standards

Section 508 requires that when Federal agencies develop, procure, maintain, or use electronic and information technology, they shall ensure that the electronic and information technology allows Federal employees with disabilities to have access to and use of information and data that is comparable to the access to and use of information and data by Federal employees who are not individuals with disabilities, unless an undue burden would be imposed on the agency. Section 508 also requires that individuals with disabilities, who are members of the public seeking information or services from a Federal agency, have access to and use of information and data that is comparable to that provided to the public who are not individuals with disabilities, unless an undue burden would be imposed on the agency. Below are the applicable Section 508 standards that to the functional areas with emphasis on 3.8, 3.9. 3.13, and 3.15.

Subpart B -- Technical Standards
§1194.21 Software applications and operating systems.
§1194.22 Web-based intranet and internet information and applications.
§1194.23 Telecommunications products.
§1194.24 Video and multimedia products.
§1194.25 Self contained, closed products.
§1194.26 Desktop and portable computers.

Subpart C -- Functional Performance Criteria
§1194.31 Functional performance criteria.

Subpart D -- Information, Documentation, and Support
§1194.41 Information, documentation, and support.